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EXAMINER	
LE, THI Q	

ART UNIT	PAPER NUMBER
2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/786,550	YUAN ET AL.	
	Examiner	Art Unit	
	THI Q. LE	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,8-9,10,11,13-16,19,21 and 23-35* is/are rejected.

7)☒ Claim(s) *12,17,18,20 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 February 2004 and 20 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date ____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d).

Information Disclosure Statement

2. The information disclosure statement (IDS) filed on 2/26/2004 was considered by the examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 1-4, 13, 27-28, 30-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)**.

Consider **claims 1 and 27**, Bethune et al. clearly show and disclose, a photon emitter (read as, first channel end, 10; figure 2) comprising: a photon generator (read as, laser diode 12; figure 2) configured to generate photons separable into a first polarisation state and a second polarisation state, the first polarisation state being orthogonal to the second polarisation state (laser diode 12 generates optical pulses have horizontal and vertical polarization; this only implies that the two polarization states are orthogonal to each other, it does not implies a known polarization (i.e. a specific angle)); and

time delay (read as, delay stage 18; figure 2) means for delaying photons having the second polarisation state with respect to those having the first polarisation state such that photons which enter the time delay means with the first polarisation exit the time delay means at a different time to photons which enter the time delay means with the second polarisation (shown in figure 2, PBS1 splits the signal S into two paths; wherein, horizontally polarized pulse P1 passes directly to PBS2, and vertically polarized pulse P2 passes through delay stage 18 then to PBS2. The two pulses P1 and P2 exit PBS2 are separated by a time delay caused by the passage

of the second vertically polarized pulse P2 through delay stage 18; figure 2, column 5 lines 31-44) (figure 2, column 4 lines 50-55; column 5 lines 31-44). Bethune fails to disclose, a photon generator configured to generate randomly polarized photons; and time delay mean is configured to receives randomly polarized photons.

In related art, Lauzon discloses a time delay mean that is configured to receive photons with unknown polarization (shown in figure 1 is an interferometer (i.e. a time delay mean) configured to receive a randomly polarized input light beam 12).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify the teaching of Bethune, wherein the delay mean is configured to receive +/-45° polarized signal, so that the delay mean can separate randomly polarized signal. Such that, the equipment use to convert unknown polarization state optical signal into +/- 45° is no longer needed. Thus, reducing the cost of the system.

Further, it is well known in the art that randomly polarized light signals are used in optical communication (Lauzon, paragraph 0002). Thus it would have been obvious for a person of ordinary skill in the art to have modified the laser diode 12, taught by Bethune, to generate randomly polarized optical signal.

Consider **claim 2, and as applied to claim 1 above**, Bethune modified by Lauzon further disclose, wherein the time delay means comprises a polarising beamsplitter (Bethune shows, polarizing beam-splitter, PBS1; figure 2) which directs photons having the first polarisation state along a first path and photons having the second polarisation state along a second path and combining means (Bethune shows, polarizing beam-splitter, PBS2; figure 2) to combine the first and second paths, one of the paths being longer than the other path (Bethune

shows, one of the path include delay stage 18; figure 2; column 4 lines 50-55; column 5 lines 32-45).

Consider **claim 3, and as applied to claim 1 above**, Bethune modified by Lauzon further described disclose, wherein one of the paths is provided with means to rotate the polarisation of photons passing through said path such that photons from the first path and the second path at the combining means have the same polarisation (Lauzon discloses, polarization rotator, 26; abstract; figure 1; paragraphs 0023).

Consider **claim 4, and as applied to claim 1 above**, Bethune modified by Moeller further disclose, wherein the time delay means comprises a single path (Bethune shows, a polarizing maintaining fiber; column 8 lines 2-5) configured to allow photons having a first polarisation state to travel at a different speed to photons with a second polarisation state.

It is obvious for a person of ordinary skill in the art to know, that polarization maintaining fiber provides the function of allow light with a particular polarization to travel through the fiber with faster speed than other polarization; thus it is possible that it can be use as a substitute for delay stage 18 (Bethune, figure 2, 3a-b; column 4 lines 50-55; column 8 lines 2-5). Using a single fiber, to act as a whole delaying stage, will reduce the cost of the system.

Consider **claim 13, and as applied to claim 1 above**, Bethune modified by Lauzon further disclose a means to rotate (Lauzon discloses, polarization rotator 26; figure 1) the polarisation of the photons by 90°, such that photons are emitted having the same polarisation (note, the photons that were delayed by delay stage 18, as disclosed by Bethune et al., prior to entering the polarization rotator 26) (Lauzon, abstract; figure 1; paragraphs 0023).

Consider **claim 28, and as applied to claim 27 above**, Bethune modified by Lauzon further disclose, separating photons having the first polarisation state from those having the second polarisation state (Bethune shows, a polarizing beam-splitter, divides light wave with polarization P2 to one path and those with polarization P1 to another path; figure 2; column 5 lines 32-45).

Consider **claim 30, and as applied to claim 27 above**, Bethune modified by Lauzon further modulating the delayed photons as they pass through the interferometer such that photons which initially had the first and second polarisation states emerge from the interferometer with the same phase shift (Lauzon discloses, the phase shifter 32, adjusted the phase of the two polarized beam, so that they have the same phase; figure 1) (note, randomly polarized light are not in phase with each other, thus, one beam is considered to be delayed with respect to the other) (Lauzon, abstract; figure 1; paragraph 0024).

Consider **claim 31**, Bethune et al. clearly show and disclose, a polarisation distinguisher (read as, an interferometer including, polarizing beam-splitters PBS1 and PBS2, and delay stage 18) for a photon generator (read as, laser diode 12) configured to generate photons separable into a first polarisation state and a second polarisation state, (laser diode 12 generates optical pulses have horizontal and vertical polarization; this only implies that the two polarization states are orthogonal to each other, it does not implies a known polarization (i.e. a specific angle), thus the polarization is unknown); said distinguisher comprising: time delay (read as, delay stage 18; figure 2) means for delaying photons having the second polarisation state with respect to those having the first polarisation state, such that photons which enter the time delay means with the first polarisation exit the time delay means at a different time to

photons which enter the time delay means with the second polarisation (shown in figure 2, PBS1 splits the signal S into two paths; wherein, horizontally polarized pulse P1 passes directly to PBS2, and vertically polarized pulse P2 passes through delay stage 18 then to PBS2. The two pulses P1 and P2 exit PBS2 are separated by a time delay caused by the passage of the second vertically polarized pulse P2 through delay stage 18; figure 2, column 5 lines 31-44). Bethune fails to disclose, time delay mean is configured to receive photons with unknown polarization.

In related art, Lauzon discloses a time delay mean that is configured to receive photons with unknown polarization (shown in figure 1 is an interferometer (i.e. a time delay mean) configured to receive a randomly polarized input light beam 12).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify the teaching of Bethune, wherein the delay mean is configured to receive +/- 45° polarized signal, so that the delay mean can separate randomly polarized signal. Such that, the equipment use to convert unknown polarization state optical signal into +/- 45° is no longer needed. Thus, reducing the cost of the system.

Further, it is well known in the art that randomly polarized light signals are used in optical communication (Lauzon, paragraph 0002). Thus it would have been obvious for a person of ordinary skill in the art to have modified the laser diode 12, taught by Bethune, to generate randomly polarized optical signal.

6. **Claims 5, 7, 14-16, 19, 21, 23-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)** and further in view of **Blow (US Patent # 5,757,912)**.

Consider **claim 5, and as applied to claim 1 above**, Bethune modified by Lauzon disclose the invention as described above; except for, encoding means, wherein photons which have passed through the time delay means are passed into an encoding means.

In related art, Blow discloses, encoding means, wherein photons which have passed through the time delay means are passed into an encoding means (read as, laser light passing through delay mean, D, then enter encoding means within the interferometer; figure 5a) (figure 5a; column 9 lines 5-20 and lines 65-67).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Blow with Bethune modified by Lauzon. Since, Blow discloses a system for quantum cryptography that is less sensitive to system noise; thus enhance the efficiency of transporting information.

Consider **claim 7 and as applied to claim 5 above**, Bethune modified by Lauzon and Blow further disclose, the encoding means (read as, phase modulator 54; figure 5a; Blow) are configured to encode the phase of a photon and comprise an interferometer, said interferometer comprising an entrance coupler (read as, coupler before the interferometer; figure 5a; Blow) connected to a long arm (read as, branch with delay loop; figure 5a; Blow) and a short arm (read as, branch with phase modulator; figure 5a; Blow), said long arm and short arm being joined at their other ends by an exit coupler (read as, coupler after the interferometer; figure 5a; Blow), one of said arms a having phase modulator which allows the phase of a photon passing through that arm to be set to one of at least two values (read as, phase modulator can module the phase of the polarized beam to either 0 or π) (Blow; figure 5a; column 9 lines 5-20; table 1).

Consider **claim 14**, Bethune discloses, a quantum communication system (read as, first channel end, 10, and second channel end 20; figure 2) comprising: a photon emitter (read as, first channel end, 10; figure 2) comprising: a photon generator (read as, laser diode, 12; figure 2) configured to generate photons separable into a first polarisation state and a second polarisation state, the first polarisation state being orthogonal to the second polarisation state (laser diode 12 generates optical pulses have horizontal and vertical polarization; this only implies that the two polarization states are orthogonal to each other, it does not implies a known polarization (i.e. a specific angle), thus the polarization is unknown); time delay (read as, delay stage, 18; figure 2) means for delaying photons having the second polarisation state with respect to those having the first polarisation state, wherein photons which enter the time delay means with the first polarisation exit the time delay means at a different time to photons which enter the time delay means with second polarisation and photons with the first polarisation are temporally separated from photons with the second polarisation when entering the encoding means (shown in figure 2, PBS1 splits the signal S into two paths; wherein, horizontally polarized pulse P1 passes directly to PBS2, and vertically polarized pulse P2 passes through delay stage 18 then to PBS2. The two pulses P1 and P2 exit PBS2 are separated by a time delay caused by the passage of the second vertically polarized pulse P2 through delay stage 18; figure 2, column 5 lines 31-44) (figure 2, column 4 lines 50-55; column 5 lines 31-44). Bethune fails to disclose, (figure 2; column 4 lines 50-55; column 5 lines 32-55). Bethune et al. fails to disclose, time delay mean is configured to receives randomly polarized photons; encoding means, wherein photons which have passed through the time delay means are passed into an encoding means; and the communication system further comprising a receiver having means to decode the photons and a detector.

In related art, Lauzon discloses a time delay mean that is configured to receive photons with unknown polarization (shown in figure 1 is an interferometer (i.e. a time delay mean) configured to receive a randomly polarized input light beam 12).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify the teaching of Bethune, wherein the delay mean is configured to receive +/- 45° polarized signal, so that the delay mean can separate randomly polarized signal. Such that, the equipment use to convert unknown polarization state optical signal into +/- 45° is no longer needed. Thus, reducing the cost of the system.

Further, it is well known in the art that randomly polarized light signals are used in optical communication (Lauzon, paragraph 0002). Thus it would have been obvious for a person of ordinary skill in the art to have modified the laser diode 12, taught by Bethune, to generate randomly polarized optical signal.

In related art, Blow discloses, encoding means, wherein photons which have passed through the time delay means are passed into an encoding means (read as, laser light passing through delay mean, D, then enter encoding means within the interferometer; figure 5a) (figure 5a; column 9 lines 5-20 and lines 65-67); and the communication system further comprising a receiver (read as, Detector; figure 5b) having means to decode the photons (read as, interferometer; figure 5b) and a detector (read as, detector 601 and 602; figure 5b).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Blow with Bethune. Since, Blow discloses a system for quantum cryptography that is less sensitive to system noise; thus enhance the efficiency of transporting information.

Consider **claim 15 and as applied to claim 14 above**, Bethune modified by Lauzon and further modified by Blow further disclose, wherein said encoding means are configured to encode the phase of a photon (read as, phase modulator, 54; Blow, figure 5a) and comprise a first interferometer (read as, interferometer in transmitter; Blow, figure 5a), said interferometer comprising an entrance coupler (read as, coupler before interferometer; Blow, figure 5a) connected to a long arm (read as, branch with delay loop; Blow, figure 5a) and a short arm (read as, branch with phase modulator, 54; Blow, figure 5a), said long arm and short arm being joined at their other ends by an exit coupler (read as, coupler after the interferometer; Blow, figure 5a), one of said arms having phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values (read as, phase modulator can module the phase of the polarized beam to either 0 or π; Blow, figure 5a) (Blow; figure 5a; column 9 lines 5-20; table 1), the receiver comprising a second interferometer (read as, interferometer on Detector side; Blow, figure 5b), the second interferometer comprising an entrance coupler connected to a long arm and a short arm, said long arm and short arm being joined at their other ends by an exit coupler, one of said arms having second phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values (read as, coupler before interferometer; Blow, figure 5b) connected to a long arm (read as, branch with delay loop; Blow, figure 5b) and a short arm (read as, branch with phase modulator, 58; Blow, figure 5b), said long arm and short arm being joined at their other ends by an exit coupler (read as, coupler after the interferometer; Blow, figure 5b), one of said arms having phase variation means which allows the phase of a photon passing through that arm to be set to one of at least two values (read as,

phase modulator, 58, can module the phase of the polarized beam to either 0 or π; Blow, figure 5b) (Blow; figure 5b; column 9 lines 32-40; table 1).

Consider **claim 16 and as applied to claim 15 above**, Bethune modified by Lauzon and further modified by Blow further disclose, directing means (read as, combination of polarization controller and coupler before the interferometer in the Detector; Blow, figure 5b) configured to ensure that photons which have passed through the short arm of the first interferometer are directed down the long arm of the second interferometer and photons which have passed through the long arm of the first interferometer pass through the short arm of the second interferometer (Blow; note, looking at figure 5a-b, pulses with superscript "//" are going through the long arm and pulses with superscript $\perp$ are going through the short arm, of the interferometer in the Transmitter; while those same pulses: pulses with superscript "//" are going through the short arm and pulses with superscript $\perp$ are going through the long arm, of the interferometer in the Detector) (Blow; figure 5b; column 9 lines 5-40).

Consider **claim 19 and as applied to claim 14 above**, Bethune modified by Lauzon and further modified by Blow further disclose, means to apply a gating signal to the detector (read as, bias supply, 60; Blow; figure 5b), said gating signal being provided to switch the detector between an `on mode` where photons may be detected and an `off mode` where photons may not be detected (note, by controlling the bias supply 60, detectors 601 and 602 can be controlled to be in a receiving state or non-receiving state) (Blow; figure 5b; column 9 lines 32-40).

Consider **claim 21 and as applied to claim 19 above**, Bethune modified by Lauzon and further modified by Blow further disclose, wherein the detector is in an "on mode" for the two intervals (read as, time for two pulses; figure 5b; Blow) when a photon is expected after

following the first or second path in the time delay means (Blow, note, there are two pulses for each branch, as shown in figure 5b; thus the detector must be in receiving state for the period of two pulses) (Blow; Figure 5b; column 9 lines 32-40).

Consider **claim 23 and as applied to claim 14 above**, Bethune modified by Lauzon and further modified by Blow further disclose, means to communicate a clock signal between emitter and receiver (read as, laser 52; Blow, figure 5a) (figure 5a, column 9 lines 15-20).

Consider **claim 24 and as applied to claim 14 above**, Bethune modified by Lauzon and further modified by Blow further disclose, wherein a clock pulse is sent from the emitter to the receiver with each photon from the generator (read as, the second laser, 52, generate another wavelength signal for carrying the timing information from the transmitter to the detector; Blow) (Blow; figure 5a-b; column 9 lines 15-20).

Consider **claim 25 and as applied to claim 24 above**, Bethune modified by Lauzon and further modified by Blow further disclose, wherein the clock signal has a different wavelength to the photons emitted from the photon generator (read as, the second laser, 52, generate another wavelength signal for carrying the timing information from the transmitter to the detector; Blow) (Blow; figure 5a-b; column 9 lines 15-20).

Consider **claim 26 and as applied to claim 24 above**, Bethune modified by Lauzon and further modified by Blow further disclose, wherein the clock signal has a different polarisation to that of the photons sent to the receiver from the photon generator (read as, sending timing data with the quantum transmission using the same wavelength; when using the same wavelength, different polarization are used for carrying the two different type of data; Blow) (Blow, figure 5a; column 8 lines 27-35 and lines 46-50).

7. **Claims 6, 8-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)** and further in view of **Blow (US Patent # 5,757,912)** and further in view of **Moeller et al. (US Patent #6,538,787)**.

Consider **claim 6, and as applied to claim 5 above,** Bethune modified by Lauzon and Blow disclose the invention as described above; except for, wherein the encoding means is capable of performing a different encoding operation on photons with the first polarisation state than those with the second polarisation state.

In relater art, Moeller et al. disclose, an encoding means capable of performing a different encoding operation on photons with the first polarisation state than those with the second polarisation state (referring to figure 6; polarization beam-splitter splits the signal into two polarized beam going to separate branch. A phase modulator 603, 605 is located in each branch, and perform different modulation on the two polarized beam) (figure 6; column 7 lines 50-67).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Moeller et al. with Bethune modified by Lauzon and Blow. Since the apparatus/method disclose could improve PMD compensation within an optical transmission network; thus improving data transmission capabilities.

Consider **claim 8, and as applied to claim 7 above,** Bethune modified by Lauzon and Blow disclose, wherein the time delay means comprises a polarising beamsplitter (read as, PBS1; figure 2, Bethune et al.) which directs photons having the first polarisation state along a first path (read as, non-delayed path; Bethune et al.) and photons having the second polarisation state along a second path (read as, path with delay stages 18; figure 2, Bethune et al.) and combining

means to combine the first and second paths (read as, PBS2; figure 2, Bethune et al.), one of the paths being longer than the other path (read as, path with delay stage, 18, is longer than non-delayed path; figure 2, Bethune et al.). Bethune et al. as modified by Blow fail to disclose wherein said entrance coupler has first and second inputs and first and second outputs, wherein the first and second outputs are connected to the long arm and short arm of the interferometer, and photons which pass through the first path and second path are coupled into the same input of the entrance coupler.

In related art, Moeller et al. disclose, entrance coupler has first and second inputs (read as, inputs into coupler 506; figure 5) and first and second outputs connected (read as, outputs from coupler 506; figure 5), wherein said first and second outputs are connected to said long arm and short arm of the interferometer (read as, long arm has delay loop 516, short arm has phase modulator; figure 5), and photons which pass through the first path and second path are coupled into the same input of the entrance coupler (note, it is a matter of design choice for combining the photons which pass through the first path and second path are coupled into the same input of the entrance coupler; since after the signals are input into the entrance coupler, it is then split again into first and second output of the entrance coupler. Thus, the result are the same when the signals are inputted into the first and second input of the entrance coupler, and outputted from the first and second output of the entrance coupler)(figure 5; column 7 lines 20-38).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Moeller et al. with Bethune modified by Lauzon and Blow. Since the apparatus/method disclose could improve PMD compensation within an optical transmission network; thus improving data transmission capabilities.

Consider **claim 9, and as applied to claim 8 above**, Bethune modified by Lauzon and Blow and Moeller further discloses, a modulator (Lauzon disclose, phase shifter 32) is capable of providing a different modulation to photons which pass through the first path (Lauzon disclose, TM path) than those which path through the second path (Lauzon disclose s, TE path), such that photons generated with the first or second polarisation state exit the interferometer with the same phase state (Lauzon disclose, TM and TM state from both path with same phase shift) (Lauzon, abstract; figure 1; paragraphs 0023).

Consider **claim 10, and as applied to claim 7 above**, Bethune modified by Lauzon and Blow disclose, wherein the time delay means comprises a polarising beamsplitter (read as, PBS1; figure 2, Bethune et al.) which directs photons having the first polarisation state along a first path (read as, non-delayed path; Bethune et al.) and photons having the second polarisation state along a second path (read as, path with delay stages 18; figure 2, Bethune et al.) and combining means to combine the first and second paths (read as, PBS2; figure 2, Bethune et al.), one of the paths being longer than the other path (read as, path with delay stage, 18, is longer than non-delayed path; figure 2, Bethune et al.). Bethune modified by Lauzon and Blow failed to disclose wherein said entrance coupler has first and second inputs and first and second outputs connected, wherein said first and second outputs are connected to said long arm and short arm of the interferometer, and said entrance coupler also provides the combining means for the first path and the second path such that photons which follow the first path enter the entrance coupler by the first input and photons which follow the second path enter the entrance coupler by the second input.

In related art, Moeller et al. disclose, entrance coupler has first and second inputs (read as, inputs into coupler 506; figure 5) and first and second outputs connected (read as, outputs from coupler 506; figure 5), wherein said first and second outputs are connected to said long arm and short arm of the interferometer (read as, long arm has delay loop 516, short arm has phase modulator; figure 5), and said entrance coupler also provides the combining means for the first path (read as, upper path of unit 508, that has no phase modulator in it; figure 5) and the second path (read as, lower path of unit 508, which has a phase modulator in it; figure 5) such that photons which follow the first path enter the entrance coupler by the first input (read as, upper input of each couplers 506; figure 5) and photons which follow the second path enter the entrance coupler by the second input (read as, lower input of each couplers 506; figure 5) (figure 5; column 7 lines 20-38).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Moeller et al. with Bethune modified by Lauzon and Blow. Since the apparatus/method disclose could improve PMD compensation within an optical transmission network; thus improving data transmission capabilities.

8. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)** and further in view of **Blow (US Patent # 5,757,912)** and further in view of **Reingand et al. (US PGPub 2003/0058499)**.

Consider **claim 11, and as applied to claim 5 above**, Bethune modified Lauzon and Blow disclose the invention as described above; except for, wherein the photons are encoded using polarisation.

In related art, Reingand et al. disclose, the photons are encoded using polarisation (read as, polarization shift keying can be use to encoded information in an optical signal for transmission) (paragraphs 0074 and 0078).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Reingand et al. with Bethune modified Lauzon and Blow. Because Reingand et al. disclose a coherent detection system, which has higher sensitivity; thus allow for reduction of power consumption of emitters when transmitting signals).

9. **Claim 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)** and further in view of **Szafraniec (US PGPub 2002/0122180).**

Consider **claim 29, and as applied to claim 27 above**, Bethune modified Lauzon disclosed the invention as described above; except for, rotating the polarisation of the delayed photons by 90°.

In related art, Szafraniec discloses, rotating the polarisation of the delayed photons by 90° (referring to figure 10, signal V_b gets pass through delay line 1054, then to faraday mirror 1056; faraday mirror 1056 rotates the signal V_b by 90°) (figure 10; paragraph 0075).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Szafraniec with Bethune modified by Lauzon. Since, the apparatus provides intensity noise suppression and polarization independence; thus decreasing error during transmission.

10. **Claims 32-35 are** rejected under 35 U.S.C. 103(a) as being unpatentable over **Bethune et al. (US Patent # 6,188,768)** in view of **Lauzon (US PGPub 2004/0165808)** and further in view of **Blow (US Patent # 5,757,912)** and further in view of **Foden et al. (US PGPub 2002/0097874)**.

Consider **claim 32, and as applied to claim 1 above**, Bethune modified by Lauzon disclosed the invention as described above, except for, wherein the photon generator comprises a single photon source.

In related art, Foden discloses an optical communication system, wherein on the transmit side includes the photon generator comprises a single photon source (figure 4 shows, a pulsed laser diode 5).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Foden with Bethune modified by Lauzon. Since Foden method of using the single photo source increases the data rate.

Consider **claim 33, and as applied to claim 32 above**, Bethune modified by Lauzon and Foden disclosed the invention as described above, except for, wherein the single photon source emits a single photon pulse having a duration in a range of 100 ps to 1 ns.

Since, Foden discloses the use a pulsed laser source. It would have been an obvious matter of design choice to modify the pulsed laser source to produce photon pulses in a range of 100ps to 1ns. Since the applicant have disclose any advantages or the solves any stated problems or for any particular purpose; thus a person of ordinary still in the art would have known to modify the photon pulses duration to be in a range of 100ps to 1ns.

Consider **claim 34, and as applied to claim 27 above**, is rejected for the same reason as claim 32 above.

Consider **claim 35, and as applied to claim 34 above**, is rejected for the same reason as claim 33 above.

Allowable Subject Matter

11. **Claims 12, 17, 18, 20 and 22** objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

12. Any response to this Office Action should be **faxed to** (571) 273-8300 **or mailed to**:

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Alexandria, VA 22314

13. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Thi Le whose telephone number is (571) 270-1104. The Examiner can normally be reached on Monday-Friday from 7:30am to 5:00pm.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 703-305-3028.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

/Thi Q Le/

Examiner, Art Unit 2613

/Kenneth N Vanderpuye/

Supervisory Patent Examiner, Art Unit 2613